

ATTORNEY DOCKET NO. KRAMER 2-1-3

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: David B. Kramer, *et al.*

Serial No.: 10/044,185

Filed: January 9, 2002

Title: NON-BLOCKING CROSSBAR AND METHOD OF OPERATION  
THEREOF

Grp./A.U.: 2461

Examiner: Jason E. Mattis

Confirmation No.: 9779

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

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ATTENTION: Board of Patent Appeals and Interferences

Sirs:

**APPEAL BRIEF UNDER 37 C.F.R. §41.37**

This is an appeal from a Final Rejection dated July 26, 2010 (hereinafter "Office Action"), of Claims 1-20. The Appellants submit this Brief with the statutory fee of \$540.00 as set forth in 37 C.F.R. §41.20(b)(2), and hereby authorize the Commissioner to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 08-2395.

This Brief contains these items under the following headings, and in the order set forth below in accordance with 37 C.F.R. §41.37(c)(1):

- i) **REAL PARTY IN INTEREST**
- ii) **RELATED APPEALS AND INTERFERENCES**
- iii) **STATUS OF CLAIMS**
- iv) **STATUS OF AMENDMENTS**
- v) **SUMMARY OF CLAIMED SUBJECT MATTER**
- vi) **GROUND OF REJECTION TO BE REVIEWED ON APPEAL**
- vii) **APPELLANTS' ARGUMENTS**
- viii) **APPENDIX A - CLAIMS**
- ix) **APPENDIX B - EVIDENCE**
- x) **RELATED PROCEEDINGS APPENDIX**

**i) REAL PARTY IN INTEREST**

The real party in interest in this appeal is the Assignee, Lucent Technologies Inc.

**ii) RELATED APPEALS AND INTERFERENCES**

Appellants do not know of any prior or pending Appeals, Interferences, or Judicial Proceedings directly related to, directly affecting, directly affected by, or having a bearing on the Board's decision in this Appeal.

**iii) STATUS OF THE CLAIMS**

Claims 1-20 are rejected.

Herein, all rejections of Claims 1-20 are being appealed.

**iv) STATUS OF THE AMENDMENTS**

No amendments have been made in response to the Office Action and no amendments are pending.

**v) SUMMARY OF CLAIMED SUBJECT MATTER**

Independent Claim 1 features a non-blocking crossbar. The non-blocking crossbar comprises  $n$  inputs,  $n$  outputs, and a scheduler.  $N$  numbers at least two. Each of the  $n$  outputs has: (1) a destination first-in, first-out (FIFO) buffer; and (2)  $n$  crossbar FIFOs interposing ones of the  $n$  inputs and the destination FIFO. Each of the  $n$  interposing crossbar FIFOs is unique to one of the  $n$  outputs.

The scheduler is configured to cause a plurality of packets that are unencapsulated, unsegmented, and of differing lengths to be transmitted from one of the inputs toward one of the outputs only when both the destination FIFO associated with the output and the interposing one of the crossbar FIFOs have sufficient memory at a same time to receive and then contain an entirety of a packet of the plurality of packets. (*See, e.g.*, Fig. 2 and paragraphs [0031]-[0034] of the original specification.)

Independent Claim 8 describes a method of operating a non-blocking crossbar. The method employs  $n$  inputs and  $n$  outputs, where  $n$  is at least two. Each of the outputs has: (1) a destination FIFO; (2) and  $n$  crossbar FIFOs interposing corresponding ones of the  $n$  inputs and the destination FIFO. Each of the  $n$  interposing crossbar FIFOs is unique to one of the  $n$  outputs. The method also schedules a plurality of packets that are unencapsulated, unsegmented, and of differing lengths to be transmitted from one of the inputs toward one of the outputs only when both the destination FIFO associated with the output and the interposing one of the crossbar FIFOs have sufficient memory at a same time to receive and then contain an entirety of a packet of the plurality of packets. (*See, e.g.*, Fig. 3 and paragraphs [0039]-[0045] of the original specification.)

Independent Claim 15 features a multi-channel network line card for packet based networks. The line card comprises  $n$  physical interfaces (where  $n$  is at least three),  $n$  network processors, and a non-blocking crossbar coupled to the network processors and the physical interfaces. The network processors convert a packet between protocols and each of the network processors is coupled to corresponding ones of the  $n$  physical interfaces. The non-blocking crossbar includes  $n$  inputs,  $n$  outputs, and a scheduler. The  $n$  inputs receive the packet from corresponding ones of the  $n$  network processors. The  $n$  outputs transmit the packet to corresponding ones of the  $n$  physical interfaces.

Each of the outputs has: (1) a destination FIFO; and (2)  $n$  crossbar FIFOs interposing corresponding ones of the  $n$  inputs and the destination FIFO. Each of the  $n$  interposing crossbar FIFOs is unique to one of the  $n$  outputs. The scheduler causes a plurality of unencapsulated, unsegmented packets that are of differing lengths to be transmitted from one of the inputs toward one of the outputs only when both the destination FIFO associated with the output and the interposing one of the crossbar FIFOs have sufficient memory at a same time to receive and then contain an entirety of a packet of the plurality of packets. (*See, e.g.*, Figs. 1 and 2 and paragraphs [0017]-[0034] of the original specification.)

**vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

(A) Whether independent Claim 1 is obvious over a combination of U.S. Patent Application Publication No. 2002/0110086 by Reches (hereinafter “Reches”) in view of U.S. Patent No. 5,412,648 to Fan (hereinafter “Fan”) as applied by the Office Action at pages 2-5 and 13-15.

(B) Whether independent Claim 8 is obvious over the combination of Reches and Fan as applied by the Office Action at pages 2-5 and 13-15.

(C) Whether independent Claim 15 is obvious over a combination of Reches and Fan in view of U.S. Patent No. 5,905,873 to Hartmann, *et al.* (hereinafter “Hartmann”) as applied by the Office Action at pages 7-9 and 13-15.

(D) Whether dependent Claims 2-3, 6-7, 9-10, and 13-14 are obvious over the combination of Reches and Fan as applied by the Office Action at page 5.

(E) Whether dependent Claims 4-5 and 11-12 are obvious over a combination of Reches and Fan in view of U.S. Patent No. 6,975,638 to Chen, *et al.* (hereinafter “Chen”) as applied by the Office Action at page 6.

(F) Whether dependent Claims 16-17 and 20 are obvious over the combination of Reches, Fan, and Hartmann as applied by the Office Action at pages 10-11.

(G) Whether dependent Claims 18-19 are obvious over a combination of Reches, Fan, Hartmann, and Chen as applied by the Office Action at pages 11-12.

#### **vii) APPELLANTS’ ARGUMENT**

**(A) In Grounds of Rejection (A), the obviousness rejection of Claim 1 over Reches and Fan is improper because it relies on Reches to teach features that are not taught in the cited portion of Reches.**

Pending independent Claim 1 recites a non-blocking crossbar comprising  $n$  outputs where each of  $n$  outputs has a destination FIFO and  $n$  crossbar FIFOs. At Item 3 on the bottom of page 2 of the Office Action, the Examiner states:

...Reches also discloses  $n$  inputs and  $n$  outputs (See page 4 paragraphs 51-52 and Figure 1 of Reches for reference to the switch comprising  $N$  input ports and  $N$  output ports).

Paragraph [0052] of Reches defines the output ports as “OUTPUT PORT 1-OUTPUT PORT  $N$  60-69.” As such, the Examiner is equating elements 60-69 of Fig. 1 of Reches to the claimed output ports. Further at Item 3 on the bottom of page 2 and top of page 3, the Examiner continues:

...Reches further discloses each of the outputs having a destination FIFO and  $n$  crossbar FIFOs wherein each of the  $n$  crossbar FIFOs interposes a corresponding one of each of said  $n$  inputs and the destination FIFO (See page 4 paragraph 52, page 4 paragraph 55, and Figure 1 of Reches for reference to each output port having

**at least one output queue, which is an output FIFO, and for reference to input ports maintaining an output queue for each possible output, meaning for each output port there are N queues corresponding to each of the N inputs and each of the queues are interposed between a corresponding one of the N inputs and the destination FIFO).**

Paragraph [0055] of Reches teaches that queues  $Q(M,1)$ - $Q(M,N)$  21-29 of INPUT PORT M 12 are the queues for each possible output port. As such, the Examiner is equating elements 21-29 of Fig. 1 of Reches to the claimed n crossbar FIFOs. (See, also, the last row of the table at Item 7 on page 14 of the Office Action.)

As noted above, pending independent Claim 1 recites that each of n outputs has n crossbar FIFOs. Fig. 1 of Reches clearly shows that elements 21-29, equated by the Examiner as the n crossbar switches, are clearly contained in INPUT PORT M 12. As such, the elements of Reches equated by the Examiner as the claimed crossbar FIFOs are in the input 12 (and NOT in the explicitly designated outputs 61-69). However, pending independent Claim 1 recites that the crossbar FIFOs are in the output. The cited portion of Reches, relied upon by the Examiner, clearly does NOT teach or suggest the queues  $Q(M,1)$  21 through  $Q(M,N)$  29 are in any of the outputs 61-69 since the cited portion of Reches teaches the queues  $Q(M,1)$  21 through  $Q(M,N)$  29 are explicitly shown in input M12. Thus, the cited portion of Reches, relied upon by the Examiner, does NOT teach or suggest the limitation of pending independent Claim 1 that the crossbar FIFOs are in the outputs. For at least this reason, the rejection is improper because the features of Reches the Examiner asserts that teach the claimed limitations are not taught by the cited portions of Reches.

At Item 3 at the bottom of page 3 and top of page 4 of the Office Action, the Examiner recognizes that Reches does not teach the limitation of pending independent Claim 1 that packets are

only transmitted when a destination FIFO interposing one of the crossbar FIFOs have sufficient memory at a same time to receive and then contain an entirety of a packet and cites portions of Fan to cure these deficiencies of Reches. As such, the cited portions of the cited combination of Reches and Fan, as applied by the Examiner, do not provide a *prima facie* case of obviousness of pending independent Claim 1 and, therefore, the obviousness rejection of Claim 1 is improper.

**(B) In Grounds of Rejection (B), the obviousness rejection of Claim 8 over Reches and Fan is improper because it relies on Reches to teach features that are not taught in the cited portion of Reches.**

As established in Section (A) above, the cited portions of the cited combination of Reches and Fan, as applied by the Examiner, do not provide a *prima facie* case of obviousness for pending independent Claim 1. For at least the same reasons – that Reches does not teach an output with crossbar FIFOs – the cited portions of the cited combination of Reches and Fan do not provide a *prima facie* case of obviousness for pending independent Claim 8. Therefore, the obviousness rejection of pending independent Claim 8 is improper.

**(C) In Grounds of Rejection (C), the obviousness rejection of Claim 15 over Reches, Fan, and Hartmann is improper because it relies on Reches to teach features that are not taught in the cited portion of Reches.**

As established in Section (A) above, the cited portions of the cited combination of Reches and Fan, as applied by the Examiner, do not provide a *prima facie* case of obviousness for pending independent Claim 1. For at least the same reasons – that Reches does not teach an output with crossbar FIFOs – the cited portions of the cited combination of Reches and Fan do not provide a



*prima facie* case of obviousness for pending independent Claim 15. Hartmann has not been cited to cure the above-noted deficiencies of the combination of Reches and Fan but to teach other limitations of pending independent Claim 15. Therefore, the obviousness rejection of pending independent Claim 15 is improper.

**(D) In Grounds of Rejection (D), the obviousness rejections of Claims 2-3, 6-7, 9-10, and 13-14 over the applied combination of Reches and Fan are improper.**

CLAIMS 2-3 and 6-7

As established in Section (A) above, pending independent Claim 1 is non-obvious over the cited portions of the cited combination of Reches and Fan, as applied by the Examiner. Claims 2-3 and 6-7 are non-obvious over the cited combination, as applied by the Office Action, at least by their dependence on pending independent Claim 1. In addition, each of dependent Claims 2-3 and 6-7 is non-obvious in its own right by combination of the elements therein with the elements of independent Claim 1. As such, the obviousness rejections of Claims 2-3 and 6-7 are improper.

CLAIMS 9-10 and 13-14

As established in Section (B) above, pending independent Claim 8 is non-obvious over the cited portions of the cited combination of Reches and Fan, as applied by the Examiner. Claims 9-10 and 13-14 are non-obvious over the cited combination, as applied by the Office Action, at least by their dependence on pending independent Claim 8. In addition, each of dependent Claims 9-10 and 13-14 is non-obvious in its own right by combination of the elements therein with the elements of independent Claim 8. As such, the obviousness rejections of Claims 9-10 and 13-14 are improper.

**(E) In Grounds of Rejection (E), the obviousness rejections of Claims 4-5 and 11-12 over the applied combination of Reches, Fan, and Chen are improper.**

CLAIMS 4-5

As established in Section (A) above, pending independent Claim 1 is non-obvious over the cited portions of the cited combination of Reches and Fan, as applied by the Examiner. Chen has not been cited to cure the above-noted deficiencies of the cited combination of Reches and Fan. As such, pending independent Claim 1 is non-obvious over the cited portions of the cited combination of Reches, Fan, and Chen, as applied by the Examiner. Claims 4-5 are non-obvious over the cited combination, as applied by the Office Action, at least by their dependence on pending independent Claim 1. In addition, each of dependent Claims 4-5 is non-obvious in its own right by combination of the elements therein with the elements of independent Claim 1. As such, the obviousness rejections of Claims 4-5 are improper.

CLAIMS 11-12

As established in Section (B) above, pending independent Claim 8 is non-obvious over the cited portions of the cited combination of Reches and Fan, as applied by the Examiner. Chen has not been cited to cure the above-noted deficiencies of the cited combination of Reches and Fan. As such, pending independent Claim 8 is non-obvious over the cited portions of the cited combination of Reches, Fan, and Chen, as applied by the Examiner. Claims 11-12 are non-obvious over the cited combination, as applied by the Office Action, at least by their dependence on pending independent Claim 8. In addition, each of dependent Claims 11-12 is non-obvious in its own right by combination of the elements therein with the elements of independent Claim 8. As such, the obviousness rejections of Claims 11-12 are improper.

**(F) In Grounds of Rejection (F), the obviousness rejections of Claims 16-17 and 20 over the applied combination of Reches, Fan, and Hartmann are improper.**

As established in Section (C) above, pending independent Claim 15 is non-obvious over the cited portions of the cited combination of Reches, Fan, and Hartmann, as applied by the Examiner. Claims 16-17 and 20 are non-obvious over the cited combination, as applied by the Office Action, at least by their dependence on pending independent Claim 15. In addition, each of dependent Claims 16-17 and 20 is non-obvious in its own right by combination of the elements therein with the elements of independent Claim 15. As such, the obviousness rejections of Claims 16-17 and 20 are improper.

**(G) In Grounds of Rejection (G), the obviousness rejections of Claims 18-19 over the applied combination of Reches, Fan, Hartmann, and Chen are improper.**

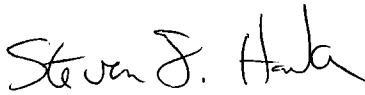
As established in Section (C) above, pending independent Claim 15 is non-obvious over the cited portions of the cited combination of Reches, Fan, and Hartmann, as applied by the Examiner. Chen has not been cited to cure the above-noted deficiencies of the cited combination of Reches, Fan, and Hartmann. As such, pending independent Claim 15 is non-obvious over the cited portions of the cited combination of Reches, Fan, Hartmann, and Chen, as applied by the Examiner. Claims 18-19 are non-obvious over the cited combination, as applied by the Office Action, at least by their dependence on pending independent Claim 15. In addition, each of dependent Claims 18-19 is non-obvious in its own right by combination of the elements therein with the elements of independent Claim 15. As such, the obviousness rejections of Claims 18-19 are improper.

**CONCLUSION**

For the reasons set forth above, allowance of all the claims presently in the application is respectfully requested, as is passage to issuance of the present application.

Respectfully submitted,

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Dated: January 17, 2011

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**viii) APPENDIX A - CLAIMS**

1. (Previously Presented) A non-blocking crossbar, comprising:  
  
n inputs, n numbering at least two;  
  
n outputs, each of said outputs having a destination first-in, first-out buffer (FIFO) and n crossbar FIFOs interposing corresponding ones of said n inputs and said destination FIFO, wherein each of said n interposing crossbar FIFOs is unique to one of said n outputs; and  
  
a scheduler configured to cause a plurality of packets that are unencapsulated, unsegmented and of differing lengths to be transmitted from one of said inputs toward one of said outputs only when both said destination FIFO associated therewith and an interposing one of said crossbar FIFOs have sufficient memory at a same time to receive, and then contain an entirety of a packet of said plurality of packets.
2. (Original) The non-blocking crossbar as recited in Claim 1 wherein said scheduler is further configured to select one of said inputs based upon a priority thereof.
3. (Original) The non-blocking crossbar as recited in Claim 1 wherein said scheduler is further configured to select one of said outputs based upon a priority thereof.
4. (Original) The non-blocking crossbar as recited in Claim 1 wherein at least two of said n inputs are coupled to different types of packet based fabrics.
5. (Previously presented) The non-blocking crossbar as recited in Claim 1 wherein a first input and a first output is coupled to a SONET network, a second input and a second output

is coupled to a Gigabit Ethernet network, and a third input and a third output is coupled to another Gigabit Ethernet network.

6. (Previously Presented) The non-blocking crossbar as recited in Claim 1 wherein each of said outputs further comprises an output arbiter configured to select one of said crossbar FIFOs and transfer a packet therein to said destination FIFO.

7. (Original) The non-blocking crossbar as recited in Claim 6 wherein said output arbiter is further configured to select said one of said crossbar FIFOs based upon packet priority.

8. (Previously Presented) A method of operating a non-blocking crossbar, comprising:  
employing  $n$  inputs,  $n$  numbering at least two;  
employing  $n$  outputs, each of said outputs having a destination first-in, first-out buffer (FIFO) and  $n$  crossbar FIFOs interposing corresponding ones of said  $n$  inputs and said destination FIFO, wherein each of said  $n$  interposing crossbar FIFOs is unique to one of said  $n$  outputs; and  
scheduling a plurality of packets that are unencapsulated, unsegmented and of differing lengths to be transmitted from one of said inputs toward one of said outputs only when both said destination FIFO associated therewith and an interposing one of said crossbar FIFOs have sufficient memory at a same time to receive, and then contain an entirety of a packet of said plurality of packets.

9. (Previously presented) The method as recited in Claim 8 wherein said scheduling further comprises selecting one of said inputs based upon a priority thereof.

10. (Original) The method as recited in Claim 8 wherein said scheduling further comprises selecting one of said outputs based upon a priority thereof.

11. (Original) The method as recited in Claim 8 wherein at least two of said n inputs are coupled to different types of packet based fabrics.

12. (Previously presented) The method as recited in Claim 8 wherein a first input and a first output is coupled to a SONET network, a second input and a second output is coupled to a Gigabit Ethernet network, and a third input and a third output is coupled to another Gigabit Ethernet network.

13. (Previously Presented) The method as recited in Claim 8 further comprising selecting one of said crossbar FIFOs and transferring a packet therein to said destination FIFO.

14. (Original) The method as recited in Claim 13 wherein said selecting further comprises selecting said one of said crossbar FIFOs based upon packet priority.

15. (Previously Presented) A multi-channel network line card for packet based networks, comprising:

n physical interfaces, n numbering at least three;

n network processors that converts a packet between protocols, each of said network processors coupled to corresponding ones of said n physical interfaces; and

a non-blocking crossbar coupled to said network processors and said physical interfaces, including:

n inputs that receive said packet from corresponding ones of said n network processors,

n outputs that transmit said packet to corresponding ones of said n physical interfaces, each of said outputs having a destination first-in, first-out buffer (FIFO) and n crossbar FIFOs interposing corresponding ones of said n inputs and said destination FIFO, wherein each of said n interposing crossbar FIFOs is unique to one of said n outputs, and

a scheduler that causes a plurality of unencapsulated, unsegmented packets that are of differing lengths to be transmitted from one of said inputs toward one of said outputs only when both said destination FIFO associated therewith and an interposing one of said crossbar FIFOs have sufficient memory at a same time to receive, and then contain an entirety of a packet of said plurality of packets.

16. (Previously presented) The multi-channel network line card as recited in Claim 15 wherein said network processors further include:

a fast pattern processor that receives said packet from corresponding ones of said n physical interfaces, said fast pattern processor analyzes and classifies said packet; and

a routing switch processor that processes said packet classified by said fast pattern processor, performs traffic management and converts said packet into an appropriate network protocol.



17. (Original) The multi-channel network line card as recited in Claim 15 wherein said scheduler selects one of said inputs based upon a priority thereof and selects one of said outputs based upon a priority thereof.

18. (Original) The multi-channel network line card as recited in Claim 15 wherein at least two of said n inputs are coupled to different types of packet based networks.

19. (Previously presented) The multi-channel network line card as recited in Claim 15 wherein a first physical interface is coupled to a SONET network, a second physical interface is coupled to a Gigabit Ethernet network, and a third physical interface is coupled to another Gigabit Ethernet network.

20. (Original) The multi-channel network line card as recited in Claim 15 wherein each of said outputs further comprises an output arbiter configured to select one of said crossbar FIFOs based upon packet priority and transfer a packet therein to said destination FIFO.

**ix) APPENDIX B - EVIDENCE**

The evidence in this appendix includes U.S. Patents to Chen, Hartmann, and Fan and a U.S. Patent Application Publication by Reches. Chen was entered in the record by the Examiner with an Office Action of March 7, 2006. Hartmann and Reches were entered in the record by the Examiner with an Office Action of December 6, 2007. Chen was entered in the record by the Examiner with an Office Action of January 22, 2009.

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**x) RELATED PROCEEDINGS APPENDIX**

NONE